

AERONAUTICAL CHARTING FORUM
Instrument Procedures Group
October 23, 2012

HISTORY RECORD

FAA Control # 12-02-303

Subject: Charting of Computer Navigation Fixes (CNFs)

Background/Discussion: Depicting the CNF on IFR charts does not serve any useful purpose and may cause confusion for pilots when they appear on non-RNAV instrument procedures. The only reference I have found regarding CNFs is AIM paragraph 1-1-19 j. 2 (emphasis added for discussion by using bolding, italicizing, and underlining portions of the text):

“A point used for the purpose of defining the navigation track for an airborne computer system (i.e., GPS or FMS) is called a Computer Navigation Fix (CNF). CNFs include unnamed DME fixes, beginning and ending points of DME arcs and sensor final approach fixes (FAFs) on some GPS overlay approaches. To aid in the approach/database correlation process, the FAA has begun a program to assign five-letter names to CNFs and chart CNFs on various FAA Aeronautical Navigation Products (AeroNav Products). **These CNFs are not to be used for any air traffic control (ATC) application**, such as holding for which the fix has not already been assessed. CNFs will be charted to distinguish them from conventional reporting points, fixes, intersections, and waypoints. The CNF name will be enclosed in parenthesis, e.g., (CFBCD), and the name will be placed next to the CNF it defines. If the CNF is not an existing point defined by means such as crossing radials or radial/DME, the point will be indicated by an “X.” **The CNF name will not be used in filing a flight plan or in aircraft/ATC communications.** Use current phraseology, e.g., facility name, radial, distance to describe these fixes.”

Questions:

1. Why is the CNF appearing on IFR paper chart products and included in cockpit displays?
2. What is the purpose of the last sentence that states: "**Use(ing) current phraseology**, e.g., facility name, radial, distance to describe these fixes."; When "...the CNF name **will NOT** be used in...aircraft/ATC communications." ?

I have yet to find just ONE Approach or Center Controller familiar with the CNF. There is absolutely no reference to the CNF in FAA Order JO 7110.65U, *Air Traffic Control*.

Publishing a CNF on an Instrument Approach Procedure could be a dangerous distraction because:

- (1) On the planview; there is no associated published data certifying its coordinates or course and distance to/from anything.
- (2) On the profile; there is no associated published data certifying any step-down or crossing altitudes.

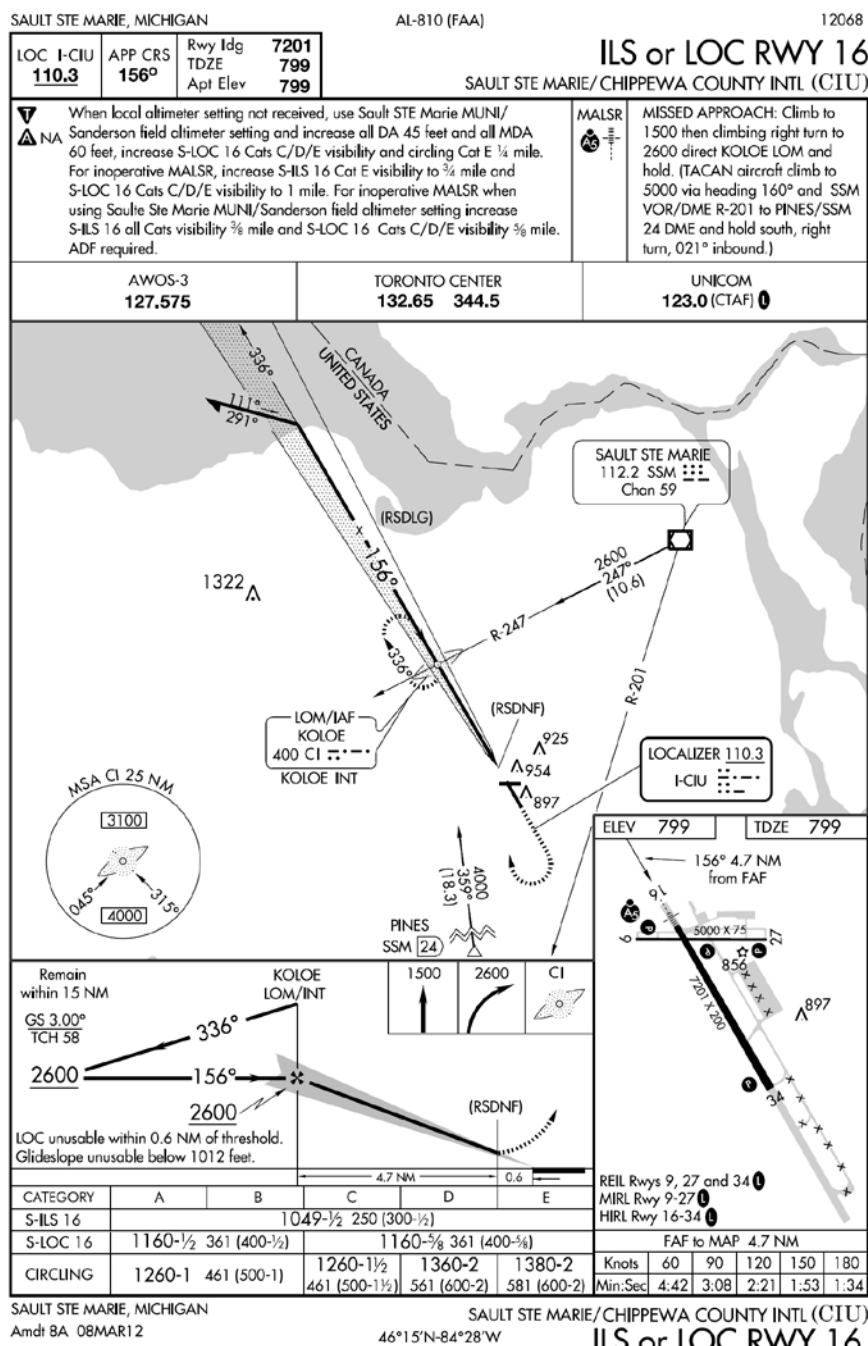
The problem is that a pilot could fly direct to the CNF because it is a waypoint in the database. This opportunity undermines the purpose and intent of the published course and altitude limits of the IAP. Safety could be compromised whenever the pilot is tempted to short-cut a published approach procedure.

In a perfect world; pilots would always do what Pilots are supposed to do. Unfortunately, some pilots don't and therefore, we have an NTSB with files full of Controlled Flight Into Terrain (CFIT) incidents. The reasons for CFIT incidents are easy to see. Some pilots do **NOT** plan their trips adequately (Title 14, CFR Part 91.103, Preflight Action). This fact is further aggravated by visual distractions such as the published CNF.

A distraction can be described as "information overload." Consider the "Funnel Effect"; No pilot needs to be distracted with useless details when approaching an airport for landing anytime and particularly at night, in IMC, with pounding rain and gusting crosswinds all to within 200 feet above the surface.

The following examples are provided to show CNF applications:

KCIU ILS or LOC RWY 16



This chart depicts 2 CNFs in the planview and 1 in the profile near DECISION HEIGHT.

Since GPS is not required to fly this procedure, it may be confusing and distracting to some pilots to see CNFs depicted on a non-RNAV instrument procedure. Mixing the use of GPS equipment with VHF Navigation equipment on this or any procedure could be confusing without adequate training.

The CNF "(RSDLG)" in the planview appears to serve NO useful purpose to pilots that do not have an understanding of AIRINC 424 coding requirements that are necessary to support the use of RNAV substitution outside the final approach segment. There is no *PUBLISHED* way to verify the CNF's exact distance from KOLOE to compare with the GPS display.

The CNF "(RSDNF)" in the planview and profile appears be co-located with DA location. How does a pilot know this for a fact? Should the pilot have to divide his/her attention between the altimeter while descending to the DA and the GPS distance display?

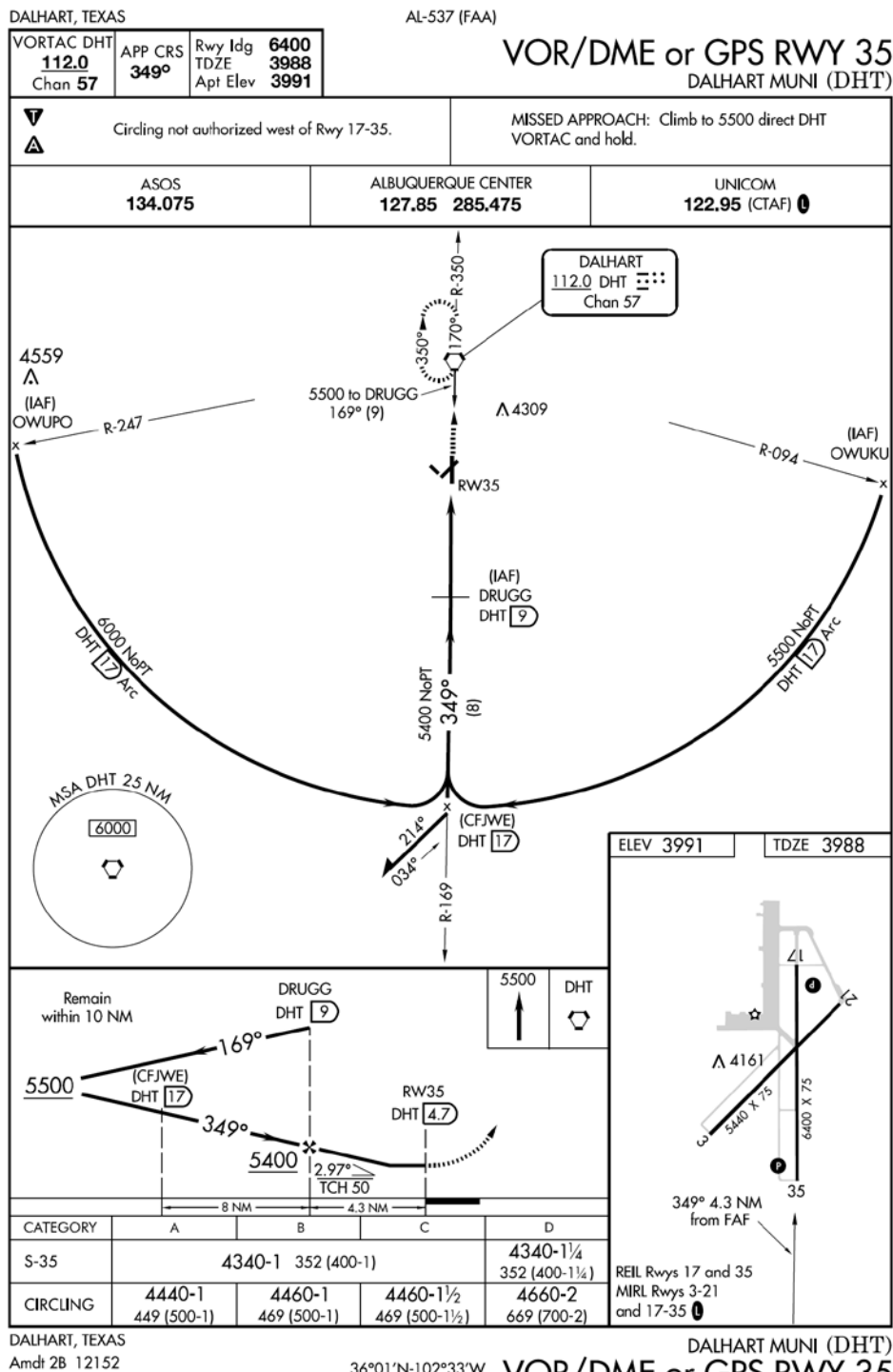
According to the AIM, these CNFs have no ATC function and are not to be used in flight planning, therefore, how can a pilot depend on any conclusions he/she may draw from the distraction of having this useless fix displayed in front of him/her. I see the message: "LOC unusable within 0.6 NM of threshold". How is a pilot supposed to reliably identify 0.6nm from the threshold when the distance to the CNF is published and the pilot can't use it for flight planning? The presence of a CNF on this procedure makes it all too easy for a pilot to forget that with an available GS, the ILS procedure terminates at DA (1049msl). With LOC only, timing would normally be used to determine the distance to the missed approach point and the pilot might not be aware that CNF is there only to support the LOC procedure for GPS equipped aircraft.

All that said; It would be very tempting for a pilot to fly direct to "(RSDNF)" without considering the intercept angle and then attempt to dive to catch the Glide Slope (GS) ONLY 250 FEET ABOVE THE GROUND! I think it is perfectly reasonable to expect from the pilot who makes that choice to NOT consider the consequences.

Every detail of information on a published chart is supposed to be there for a definable reason, ultimately in the interest of safety. It is not appropriate to suggest that a pilot should learn to ignore something published on a chart or presented on a cockpit display when it could be eliminated!

The approach phase of flight places the ultimate workload demand on the pilot. It should be the priority of the policy decision makers for chart producers responsible for chart and database updates to eliminate anything from a published procedure that undermines safety with unnecessary distractions during this most critical phase of flight!

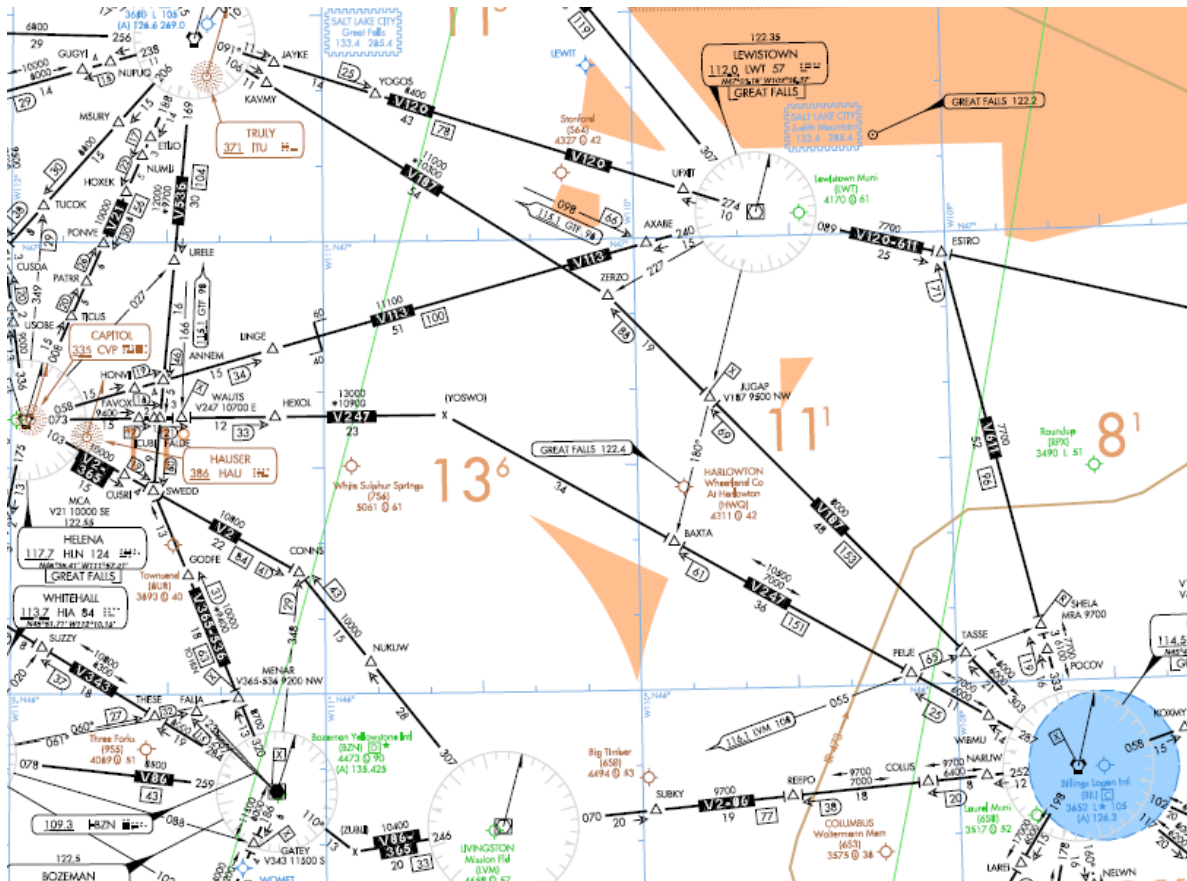
KDHT VOR/DME or GPS RWY 35



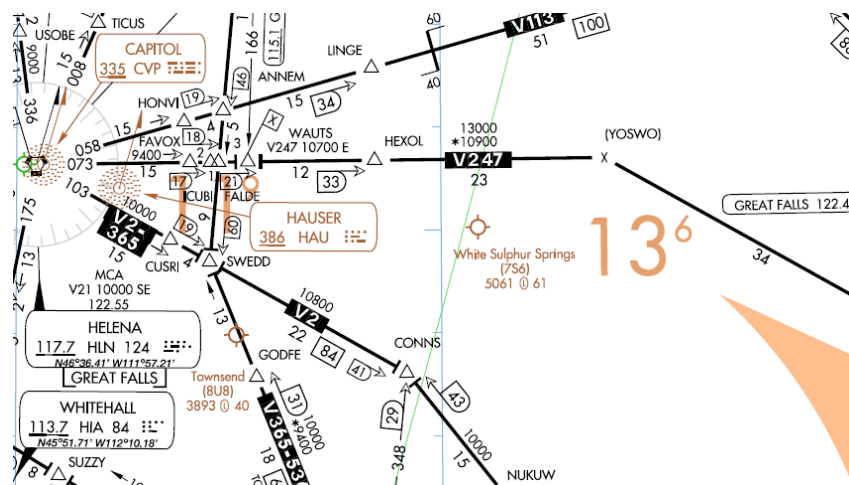
IAFs “OWUKU” and “OWUPO” are not intelligently pronounceable and are designated improperly as IAFs with an “x”.

The CNF “(CFJWE)” used to define the end of the DME arc appears in both the planview and the profile appears to suggest and could be interpreted by a pilot that the PT occurs OUTSIDE of the CNF.

L-13



The above image is a larger view of the airspace (clockwise) between HELENA, LEWISTOWN, BILLINGS, LIVINGSTON & BOZEMAN. The image below is a closer view of the (YOSWO) CNF between HELENA and Billings on V247.



Years ago, a single letter "x" on an Enroute Chart designated a Mileage Breakdown. Today it serves a dual purpose to include the CNF. Pilots have enough to worry about without the need to start multi-tasking symbology:

FIXES/ATC REPORTING REQUIREMENTS	
▲ ▲	Fix Compulsory and Non-Compulsory Position Report
△ △	RNAV Waypoint Compulsory and Non-Compulsory Position Report
◆ ◆	Denotes DME Fix (Distance same as route mileage)
←	Denotes DME Fix and Mileage
← 00	Offset arrows indicate facility forming a fix (away from VHF/UHF, toward LF/MF NAVAID)
△ →	Mileage Breakdown or Computer Navigational Fix (CNF) (no ATC function)
X X	

L13 chart legend

MILEAGES	
<i>All Mileages are Nautical (NM)</i>	
LOW /HIGH ALTITUDE	
000 000	Total Mileage between Compulsory Reporting Points and/or NAVAIDs
00 00 00	Mileage between other Fixes, NAVAIDs and/or Mileage Breakdown
X X	Mileage Breakdown or Computer Navigation Fix (CNF) (no ATC function)
(RCRCP)	Five-letter identifier in parenthesis indicates CNF with no ATC function

Aeronautical Chart User's Guide 10th ed. page 53

It's difficult to comprehend that “(YOSWO)” does not have an ATC function when CONNS intersection on V2 between HELENA-LIVINGSTON appears to function in *exactly* the same manner**. There is a VOR changeover point charted on V113 northeast of LINGE intersection between HELENA-LEWISTOWN also functioning in a similar fashion but without a change in course.

**{The change in MEA at CONNS is not addressed in the context of this RD. The comparison to “(YOSWO)” refers only to the change in course at CONNS.}

The pilot's workload is elevated by having to calculate distances toward the course/mileage breakdown (i.e., “(YOSWO)”) and should be addressed during preflight planning. Sadly, NTSB statistics appear to show that this level of preflight planning does not typically happen. However, it is obvious all of this added workload, be it on the ground or in the air, could be *eliminated* by converting “(YOSWO)” into a intersection designation with a DME fix just like CONNS if a DME solution can pass flight Inspection.

Recommendations: Although CNFs are understandably required to support RNAV system operational requirements, CNFs reflect the dark side of automation. The unintended result is a paradigm shift away from the fundamentals of flight planning. Aeronautical Decision Making (ADM) suffers at the push of a (Direct) button. Situational Awareness (SA) evaporates with the expectation of fewer mental demands. The CNF is a distraction as published and the AIM currently lacks sufficient guidance relative to CNFs appearing on non-RNAV (i.e., using ground based NAVAIDS) instrument procedures.

Every Practical Test Standard requires the examiner to introduce distractions*** during the flight test to evaluate the ADM and SA of the candidate.

It is essential to exercise forethought when constructing and publishing IAPs and Airways in the National Airspace System (NAS). The pilot's mentality has become so obviously corrupted by automation. AA 965**** is a tragic example of this sad fact. It is critical to eradicate the information overload cluttering the NAS to maximize efficiency and safety.

I recommend the CNFs on Enroute Chart products and in the GPS database be converted into a pronounceable intersection with a published DME fix where ever possible.

I recommend the removal of CNFs from published charts and from appearing the database string that is displayed in the cockpit.

3. Task Management

REFERENCE: FAA-H-8083-15A.

Objective. To determine the applicant can prioritize the various tasks associated with the planning and execution of the flight. The applicant should:

1. Explain how to prioritize tasks in such a way to minimize distractions from flying the aircraft.
2. Complete all tasks in a timely manner considering the phase of flight without causing a distraction from flying.
3. Execute all checklists and procedures in a manner that does not increase workload at critical times, such as intercepting the final approach course.

4. Situational Awareness

REFERENCES: FAA-H-8083-25, FAA-H-8083-15A.

Objective. To determine the applicant can maintain situational awareness during all phases of the flight. The applicant should:

1. Explain the concept of situational awareness and associated factors.
2. Explain the dangers associated with becoming fixated on a particular problem to the exclusion of other aspects of the flight.
3. State the current situation at anytime during the flight in such a way that displays an accurate assessment of the current and future status of the flight, including weather, terrain, traffic, ATC situation, fuel status, and aircraft status.
4. Uses the navigation displays, traffic displays, terrain displays, weather displays and other features of the aircraft to maintain a complete and accurate awareness of the current situation and any reasonably anticipated changes that may occur.

5. Controlled Flight Into Terrain Awareness

REFERENCE: Controlled Flight Into Terrain Training Aid website:
http://www.faa.gov/training_testing/training/media/cfit/volume1/titlepg.pdf.

Objective. To determine the applicant can accurately assess risks associated with terrain and obstacles, maintain accurate awareness of terrain and obstacles, and can use appropriate techniques and procedures to avoid controlled flight into terrain or obstacles by using all resources available. The applicant should:

1. Use current charts and procedures during the planning of the flight to ensure the intended flight path avoids terrain and obstacles.
2. Be aware of potential terrain and obstacle hazards along the intended route.
3. Explain the terrain display, TAWS, and/or GPWS as installed in the aircraft.
4. Use the terrain display, TAWS, and/or GPWS of the navigation displays as appropriate to maintain awareness and to avoid terrain and obstacles.
5. Plan departures and arrivals to avoid terrain and obstacles.
6. Alter flight as necessary to avoid terrain.
7. Plan any course diversion, for whatever reason, in such a way to insure proper terrain and obstruction clearance to the new destination.
8. Explain and understand aircraft performance limitations associated with CFIT accidents.

**** <http://en.wikipedia.org/wiki/AA965>
<http://www.youtube.com/watch?v=FDCiQPcgB38>

Submitter's Note: The examples in this RD are just a few of many throughout the NAS. It is not practical to list all of them in this Recommendation Document.

Comments: This recommendation affects FAA Orders 8290.19 and JO 7110.65, the Aeronautical Information Manual, the Pilot/Controller Glossary, and the Inter-agency Air Cartographic Committee specifications. This recommendation may also have an impact on ARINC 424, *Navigation System Database Standard*, and a variety of RTCA documents and Technical Standard Orders (TSOs) used in avionics systems development.

Submitted by: Robert Katz

Organization: General Aviation Pilot

Phone: 972-980-4127

FAX:

E-mail: bob867@hotmail.com

Date: October 23, 2012

Initial Discussion - MEETING 12-02: Tom Schneider, AFS-420, presented this new recommendation as offered by Robert Katz, GA Pilot. Mr. Katz is proposed that FAA cease publishing all CNFs, making the case that they are confusing and of no value to pilots. In briefing the issue, Tom noted that some of the specific examples of CNFs used in the recommendation document are charted incorrectly on the VOR/DME RWY 35 IAP at Dalhart Muni and there may be a problem with the CNF portrayed on L-13 IFR Low Altitude En Route Chart. These were referred to Brad Rush, AJV-3B, for corrective action. Tom noted that CNF inception and charting standards are a direct result of an ACF recommendation made through the Charting Group (Charting issue 97-01-91, Depiction of GPS Database Points on IAPs). The rationale behind charting CNFs is exactly contrary to Mr. Katz's suggestion; they are charted to provide chart/database harmonization to eliminate, rather than cause, pilot confusion.

Editor's Note: *Quote from the minutes of ACF Charting Group Meeting 97-02: "The ATA/Charts, Database, and Avionics Harmonization Committee recommended computer navigation fixes (CNFs) be placed on NOS charts so that pilots will be able to crosscheck the CNF with their airborne database."*

Ted Thompson, Jeppesen, presented the following comments based on internal discussions by Jeppesen's corporate technical leaders on behalf of its Standards Team:

- The inclusion of CNFs came about as a result of the Cali accident. CNFs were adopted as a response to affect standardization between charts and cockpit displays.
- CNFs do provide a standardized element between chart and database; however, CNFs are not in the ATC database.
- Despite the benefits of CNFs, there is a definite lack of a formalized process to promulgate them. The FAA does not maintain CNFs like they normally do waypoints and intersections. Although CNFs are currently being added to most 8260-series procedure source documents, CNFs are not otherwise sourced in detail as are waypoints and intersections. For example, 8260-2-series forms exist for only a portion of the total number of CNFs in the USA.
- While Jeppesen acknowledges that eNASR data is not considered to be official FAA source, we must use it in order to fully represent CNFs throughout the NAS. Unfortunately, the eNASR data is incomplete, which poses problems.
- eNASR also provides the data differently for terminal use than it does for enroute use. For example, we can only identify 100 terminal CNFs from the eNASR file and yet we know there are many, many more in existence. And the placement of the "flag" in eNASR for the terminal use CNFs is inconsistent requiring additional analysis and comparison of the data.
- Another related aspect is that the CNF concept has never been adopted by ICAO. This results in necessary reliance on points-in-space which are not officially designated or published or recognized by State authorities. Instead, in order to properly code routes and procedures, these points are instead created by commercial entities such as Jeppesen. This situation demonstrates the lack of international harmonization around the CNF concept
- While the total removal of CNFs is probably a short sighted idea, there are certainly enough issues with the concept and its current state of implementation within the USA that discussion at the FAA ACF-IPG is certainly worthwhile, especially if the discussion leads to a re-focus on FAA CNF maintenance and promulgation.

John Moore, Jeppesen, asked what FAA Order contains policy for CNFs. Tom responded, Order 8260.19 contains guidance for documenting CNFs. John went on to state there seems to be a lack of understanding regarding CNF use, little guidance on how to use them, and a need


for better AIM guidance. Brad Rush, AJV-3, responded that AFS has begun steps to standardize CNF documentation and processing and that his office is participating in the process. Brad added that the FAA's plan is to convert CNFs into pronounceable named airspace fixes (waypoints or intersections) wherever possible as airways or terminal procedures are reviewed and updated. CNFs that meet criteria are being converted into pronounceable named fixes; those that do not will remain CNFs. As a result of this ongoing program, approximately 70% of the original CNFs have been sourced on FAA Form 8260-2s. Where applicable, CNFs are also referenced on FAA Form 8260-3/5. Lev Prichard, APA, stated that CNFs are necessary to allow use of RNAV when flying conventional procedures. Paul Eure, AJE-31, commented that controllers in various regions complain frequently about CNFs and, in fact, take steps to remove them from their host computers. Curtis Davis, AJV-21, stated that there are about 1800 CNFs in the NAS, of which approximately 400 are "undocumented"; i.e., there are no FAA Forms 8260-2 to support them or they are not listed on an FAA Form 8260-3 or -5. Approximately 300 are in compliance with the new "CFXXX" naming methodology. Lance Christiansen, NGA, asked what it would take to document the remaining CNFs. Brad responded the timeline would be predicated on available resources and priorities. In summary, the group consensus was to not accept the recommendation to cease charting all CNFs. The ACF consensus is that CNFs need to be shown on charts and must remain published for chart/database harmonization. It was noted that information in the AIM should be improved to aid overall understanding for pilots and controllers. Lastly, it was recommended that guidance in Order 8260.19 regarding CNFs be more robust. It was also agreed that AJV-3B will review and correct the CNF depictions in the example procedures used in Mr. Katz's submission and develop better policy for depicting a CNF within a procedure turn. AFS-420 will review CNF policy in Order 8260.19 and update as necessary. AFS-470 will review and update AIM guidance regarding CNFs and consider moving CNF guidance to Chapter 5 vice Chapter 1. **ACTION: AJV-3B, AFS-420, and AFS-470.**

MEETING 13-01: Bill Hammett, AFS-420 (ISI Contract Support) briefed that there are three open IOUs relating to this issue and all are addressed separately below:

1. Current CNF Charting and CNF vs. PT. Valerie Watson, AJV-3B, briefed that the DME Arc CNFs on the DHT example are now correctly depicted in parentheses. She added that the Enroute example of a dogleg CNF on Victor airway 247 is correct - a 5-letter named fix would be created if there were an altitude (MEA) change at that point. She also reported that written guidance, with very clear examples has been provided to Terminal Charting. The guidance is specific in that the elbow of a procedure turn must not be depicted over a CNF; rather, position the procedure turn symbol to show the CNF inside (preferred) or outside the point where the CNF plots. This guidance is being implemented on a day-forward basis, so that over time these potentially confusing positionings of CNFs over the procedure turn elbow will be eliminated. Val recommended this portion of the issue be closed and the group agreed. This IOU is Closed

2. Order 8260.19 Guidance. Tom Schneider, AFS-420, briefed that a minor revision to FAA Order 8260.19E, paragraph 8-80h, was made in Change 3, which was effective on February 22, 2013 - see below (changes in red). This IOU is Closed:

h. Changeover Point (Not applicable for RNAV routes). Enter the changeover point in the segment where it lies. If midpoint, leave **blank**. If NOT midpoint, enter the mileage from and the identifier of the nearest facility. If a **gap** exists, the changeover point may be at the middle of the gap; however, leave **blank**. If a **dogleg course change has been established**, enter "**DL**." **When the dogleg point meets en route VHF intersection and/or DME fix criteria, establish a pronounceable named fix. When this is not possible, establish a CNF to identify the dogleg point.**

3. AIM Guidance. Kel Christianson, AFS-470, briefed that his office has prepared new AIM guidance to more clearly explain CNFs. A copy of the draft AIM change was provided all attendees and is included here (). Attendees are asked to review the draft and provide comments directly to Kel at kel.christianson@faa.gov. Based on comments received, AFS-470 will submit and track the AIM change.

A discussion followed. John Collins, GA Pilot, noted that it is difficult to define the point where airways intersect on an airway-to-airway clearance where there is no fix/NAVAID to define the intersect point. He recommend that a CNF be established wherever airways intersect and an intersection or DME fix cannot be established. Valerie Watson, AJV-3B, stated that there are “numbered fixes” with databased latitude/longitude positions for these intersections, however they are not charted. Gary McMullin, Southwest Airlines, asked if the coordinates could be charted. Valerie responded that there has never been a requirement for these positions to be charted. Paul Eure, AJE-31, stated that under the VOR Minimum Operating Network (MON) plan, there is consideration being given to converting the entire en route structure to RNAV using “T” and “Q” Routes. Ted Thompson, Jeppesen, stated that we must remember that the original submission noted problems with both terminal and en route aspects of CNFs. Ted also noted that it is ironic that the original submitter wanted to do away with CNFs all together, yet the ACF discussion seems to be indicating we need to add more. The only IOU remaining open is the AIM change, which AFS-470 will submit and track. **ACTION: AFS-470.**

MEETING 13-02: This item was discussed in conjunction with Issue 11-01-296. Kel Christianson, AFS-470, briefed that the AIM changes presented at the last meeting were finalized and have been forwarded for the next AIM publication cycle, which is February 6, 2014. AFS-470 will track the change until published. . **ACTION: AFS-470.**

MEETING 14-01: Kel Christianson, AFS-470, briefed the applicable AIM guidance has been published. The group agreed to close this issue.

Status: **Issue CLOSED**